New Brunswick
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Guide to Operations

Galaxy S Series
48 S CO_2 Incubator

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CAUTION!

This equipment *must* be operated as described in this manual. If operational guidelines are not followed, equipment damage and personal injury *can* occur.

Please read the entire User's Guide before attempting to use this incubator.

Do not use this equipment in a hazardous atmosphere or with hazardous materials for which the equipment was not designed.

New Brunswick Scientific (NBS) is not responsible for any damage to this equipment that may result from the use of an accessory not manufactured by NBS.

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Manual Conventions

NOTE: **Notes contain essential information that deserves special attention.**

CAUTION! ***Caution* messages appear before procedures which, if caution is not observed, could result in damage to the equipment.**

WARNING! ***Warning* messages alert you to specific procedures or practices which, if not followed correctly, could result in serious personal injury.**

WARNING! **This particular *Warning* message represents a potential electrical hazard.**

This particular *Warning* message, whether found in the manual or on the incubator means HOT SURFACE–and therefore represents a potential danger to touch.

CRUSH WARNING! ***Crush Warning* messages alert you to specific procedures or practices regarding heavy objects which, not followed correctly, could result in serious personal injury.**

This symbol on the incubator is a reminder that it is of essential importance to read the user manual.

WARRANTY
Every Instrument manufactured by
New Brunswick Scientific (NBS) is warranted to be free
from defects in material and workmanship. This apparatus, with
the exception of glassware, lamps and electrodes (where supplied),
is warranted for 2 years against faulty components & assembly and
our obligation under this warranty is limited to repairing or replacing
the instrument or part thereof which shall within 2 years following
date of shipment prove to be defective after our examination.
Incubator accessories are warranted for 1 year. This warranty does
not extend to any NBS products which have been subjected
to misuse, neglect, accident or improper installation or
application; nor shall it extend to products which
have been repaired or altered outside the NBS
factory without prior authorization from
New Brunswick Scientific.

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1 INTRODUCTION

The Galaxy 48 S CO_2 incubator is microprocessor controlled and designed to ensure accurate and reliable operation. The incubator incorporates a simple, door-mounted touch-sensitive keypad with two individual three-digit LED displays that allow for easy programming and monitoring of the chamber conditions.

A direct heating system, utilizing a thermal heating element, completely surrounds the incubator, providing an even temperature within the seamless chamber. The independently and directly heated outer door is designed to ensure an even distribution of heat. This system ensures a rapid, controlled return to optimum chamber conditions after a door opening while also preventing any overshoot. The incubator's direct heat system provides for optimal use of laboratory space by allowing the most efficient internal volume for the footprint of the instrument. A viewing window within the door allows for sample viewing without disturbing chamber conditions.

A solid-state infrared sensor is used to control the level of CO_2, providing excellent reliability and remaining unaffected by humidity. The CO_2 system has a programmable automatic zero system (AutoZero) to re-reference the sensor baseline to atmospheric CO_2 levels at regular intervals. A small pump supplies HEPA-filtered atmospheric gas to the sensor. The chamber atmosphere within the sensor is completely displaced, allowing the control system to automatically reference the sensor, after which the pump is switched off, allowing the chamber atmosphere to homogenize back into the sensor. This provides for accurate CO_2 control without disturbing the chamber environment.

An independently controlled water tray at the bottom of the incubator allows a high, uniform relative humidity while preventing condensation in other parts of the chamber. Perforated shelves are provided as standard to facilitate recovery of RH conditions in the chamber.

The seamless 48-liter chamber and all internal components are manufactured from polished stainless steel. The shelves (which are non-tip), shelf racks and humidity tray are easily removed without tools for thorough cleaning and are capable of being sterilized. Air circulation is achieved without the use of a fan, eliminating ductwork (a potential source of contamination), simplifying cleaning, eliminating vibration, and reducing small sample evaporation within the chamber. The outer shell of the incubator is manufactured from powder-painted steel for a durable finish.

The Galaxy 48 S model contains many standard features usually seen as options. In addition to its viewing window to allow visualization of the cultures without compromising the internal atmosphere, there is a 25mm access port now standard to allow for seamless integration of independent probes or other equipment through the chamber. NBS has also included an RS232 port as standard on all Galaxy S series incubators. This port will communicate with any computer through a hyperlink access or can be used to externally datalog the incubator through NBS software.

The incubator incorporates a two-level alarm system. The chamber-monitoring alarms are programmable and will alert you if temperature or CO_2 have not recovered within a preset time after the door has been opened. If it is not required, this system can be disarmed. The system alarms occur only if a system component problem has developed that requires user intervention to rectify. The incubator also incorporates an over-temperature safety system that operates independently from the main control system.

2 UNPACKING & INSTALLATION

2.1 Inspection of Boxes

After you have received your order from New Brunswick Scientific, inspect the boxes carefully for any damage that may have occurred during shipping. Report any damage to the carrier and to your local NBS Sales Order Department or distributor immediately.

2.2 Unpacking

CRUSH WARNING!

At least two people are required to safely lift your 48 S.

Disassemble the wooden shipping crate and remove the protective packing. Save the packing materials for possible future use, and be sure to save this User's Guide for instruction and reference.

CAUTION!

NEVER try to lift the incubator by its door; this would cause permanent damage to the incubator.
NEVER lean on or place objects on the open door.

To simplify lifting the incubator, leave it on the pallet. You must have at least one person *at either side* to safely lift the incubator. *Supported by the base only*, remove the incubator by lifting it from the delivery pallet.

Locate and remove the parts stored in the Humidity Tray.

If any part of your order was damaged during shipping, is missing, or fails to operate, please fill out Customer Satisfaction Form 6300 (packed in the envelope with your warranty card) and return it by fax or mail. You can also call New Brunswick Scientific's or your distributor's service department.

Using your NBS packing list, verify that you have received the correct materials and that nothing is missing.

Table 1 outlines the accessory items that are supplied with your new incubator:

Table 1: Accessories Provided

Quantity	Item	Notes
3	Non-tip Shelves	Packed Separately
2	Wire Shelf Racks	Packed Separately
1	Humidity Tray	Packed Separately
14	Silicone Rubber Suction Feet	Installed
1	White porous CO_2 Sensor Cover	Installed
1	Black Sensor Cover*	Installed
1	Power Cord	Packed in accessories bag
3 meters, 9.8 feet	PVC Tubing, ~1/4-inch or 6mm bore, with an inline CO_2 HEPA-filter connected, ready for use	Packed in accessories bag
2	Hose Clips	Packed in accessories bag
1	AutoZero HEPA Filter	Packed in accessories bag
4	Adjustable Feet	Packed in accessories bag
4	Anti-slip Pads for adjustable feet	Packed in accessories bag
1	User Manual	Provided

* There is a holder at the rear of the incubator to store the black sensor cover.

WARNING!

Anytime you touch or handle the white CO_2 sensor cover, be sure to wear gloves, and do not later touch those gloves to your face. Discard or wash the gloves.

2.3 Utilities

In order to use the incubator, you will need:

Table 2: Utilities

Utility	Requirement
Electricity	100/120V, 50/60 Hz grounded electrical supply with minimum capacity of 6 amps (or 8 amps for High Temperature Disinfection Models)
	OR
	220/240V, 50 Hz grounded electrical supply with minimum capacity of 3 amps (or 5 amps for High Temperature Disinfection Models)
CO_2 Gas	Cylinder with 100% CO_2 vapor withdrawal, together with a two-stage regulator for pressure control to 5 psi or 0.35 bar

WARNING!

For proper incubator operation, CO_2 gas pressure must not exceed 5 psi.

2.4 Location

The incubator is designed to operate at a chamber temperature of 4.0°C above ambient, and at an absolute minimum ambient temperature of 15°C if the incubator is being used at 37°C. *Care should be taken to avoid placing the incubator in a position that may affect its performance, such as those listed below.*

NOTE:
For optimum performance, maintain ambient operating temperature within the range of 18-24°C.

DO NOT place the incubator:

- **Directly under, beside or within the air-flow of heating or air-conditioning ducts, or other drafts;**
- **Directly beside heat-generating equipment such as a heater, an autoclave or an oven;**
- **Near the exhaust of heat- or cold-generating equipment (like a –86°C freezer);**
- **Near a window exposed to direct, unshaded sunlight.**

Place the incubator in the working position, on a level surface capable of bearing its weight of approximately 70.5 lbs/32 kg (actual use weight will be heavier and will depend on the options installed and the material stored in the incubator).

The incubator is not designed to be directly stackable. A second incubator may be safely stacked on top of another identical incubator by using the custom-designed stacking stand available as an accessory for the Galaxy 48 S. It is not possible to put any other type of incubator or heavy apparatus on top, as the top cover and stacking stand were not designed to support any other device.

2.5 Installing the Feet

To ensure adequate airflow for correct operation of the relative humidity control system the incubator feet *must* be installed. *More than one person is required* to perform this operation.

To insert the adjustable feet:

1. If they are not already installed, install the locking nuts onto each of the four feet provided.
2. Beginning with the front pair: tilt the incubator toward the back, and screw the feet in, to the required depth.
3. Tilt the incubator forward to install the rear pair of feet.
4. Put an anti-slip pad (provided) on each foot and keep them installed at all times.

2.6 Setting Up

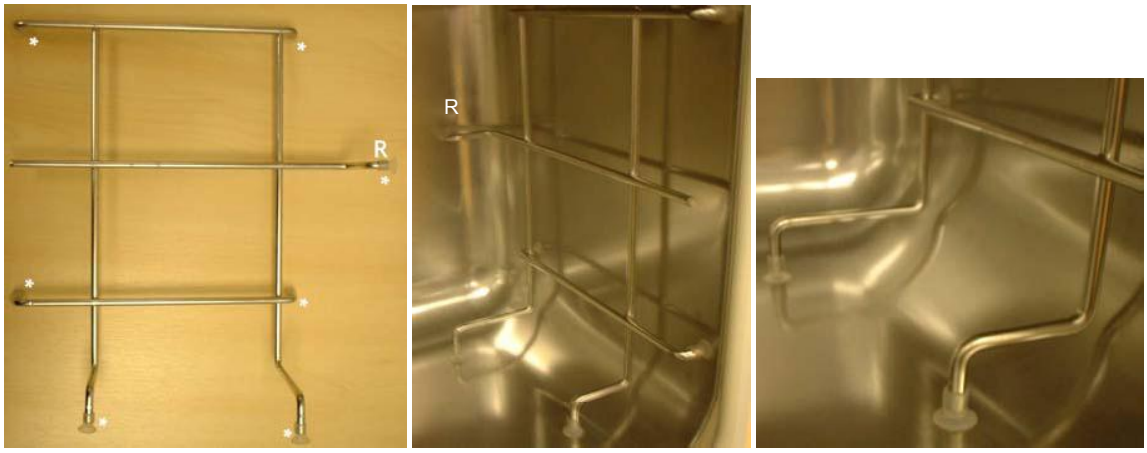
Install the power cord:

1. Insert the power cord into its receptacle on the back on the incubator.
2. Press the cord firmly into its socket.

Install the shelf racks and shelves, and level the incubator:

1. Each wire shelf rack has silicone suction cups that hold the rack in place. Install the silicone suction cups onto the wire rack supports (7 per rack, each marked with an asterisk in *Figure 1a below*).
2. Note that there are lefthand and righthand racks. The suction cup marked **R** ("Rear") goes to the rear of the chamber as shown in *Figure 1b* below. The suction cups will adhere to the chamber walls even if they are dry; but if you feel it is necessary, you can dampen them with distilled water to increase adhesion.
3. Ensure the shelf racks are installed squarely in the chamber so the shelves will sit on a level plane (*see Figure 1c below*).

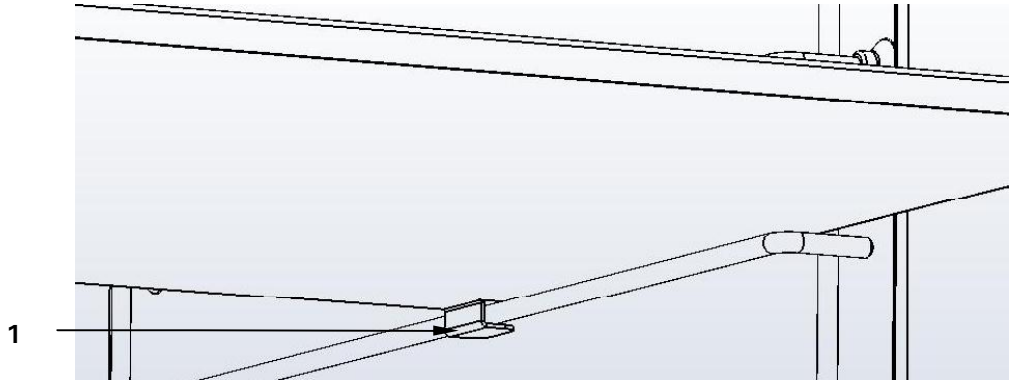
Figure 1: Installing Shelf Racks



a **b** **c**

4. Install the three shelves, making sure that each shelf's anti-tip tab is properly inserted onto each of the wire shelf rack guides (*see Figure 2 below*).

Figure 2: Installing Shelves



1	Anti-tip tab

5. Level the incubator by adjusting the feet. Place a small level on the second shelf of the incubator. Adjust the leveling feet until the incubator is level and stable. Lock the leveling legs in place by tightening the locking nuts on each leg.

Install the humidity tray:

1. Install the humidity tray in its location beneath the lowest shelf rack position: insert the tray diagonally (*see Figure 3a*), then turn the tray 45° as shown, until you can set it in position, resting on the chamber floor, with its front and rear edges resting just above the shelf rack supports (*see Figure 3b*).

Figure 3: Installing/Removing the Humidity Tray

a **b**

1	Center the tray, making sure it sits within the rack supports.

Connect the CO_2 gas supply:

WARNING!

Slightly increased levels of CO_2 may be found in and around the operating area of the CO_2 incubator. Over time, this can have adverse effects on those exposed to such an environment. Users working in environments with elevated levels of CO_2 should take all appropriate precautions to protect their breathing.

1. Connect the incubator to the CO_2 supply using the ~1/4-inch or 6mm plastic tubing (with installed HEPA filter) by attaching the tubing from the two-stage regulator (or in-line regulator) to the matching CO_2 inlet on the rear of the incubator.

NOTE:

It is highly recommended that an in-line regulator be used at the incubator's gas inlet(s).

For proper incubator operation, CO2 gas pressure must not exceed 5 psi (0.35 bar).

2. Use the tubing clips provided to eliminate CO_2 leaks.

Install the HEPA AutoZero filter:

1. Press the AutoZero HEPA filter gently into the white plastic filter socket at the top of the rear panel of the incubator (*see Figure 4*).

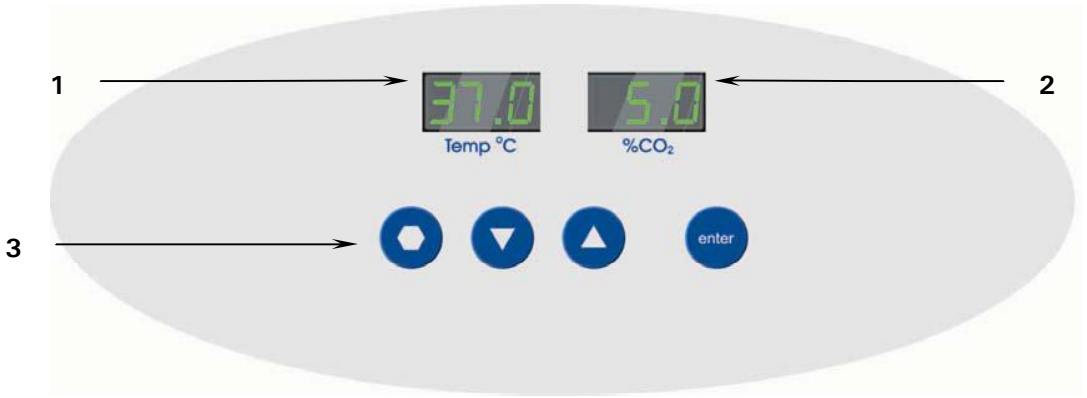
Figure 4: AutoZero HEPA Filter & Fitting

3 OPERATION

3.1 Control Panel

The control panel consists of two LCD displays and four function keys (*see Figure 5*):

Figure 5: Control Panel



1	Temperature display	2	CO_2 display	3	Function keys

Table 3: Function Keys

Key Symbol	Key Name	Function
⬣	Programming	Press this key to enter Programming mode, and to set values in either display. Press this key simultaneously with the Enter key to perform AutoZero.
▼	Down	In Programming mode, use this key to scroll down through numbered values in the display. Press this key simultaneously with the Enter key to work in the Alarm system.
▲	Up	In Programming mode, use this key to scroll up through numbered values in the display.
enter	Enter	Press this key to save a new setpoint. Press this key simultaneously with the Programming key to perform AutoZero. Press this key simultaneously with the Down key to work in the Alarm system.

NOTE:
If you accidentally press both the Up and Down keys simultaneously, you will engage Engineering Mode: immediately press the Programming key (⬣) to exit.

3.2 Preparing for Operation

1. Remove the black protective cover from the CO_2 sensor (located on the back surface of the internal chamber), and store it for use when you clean the incubator. There is a storage holder for the cover on the back on the incubator.
2. Ensure that the white porous sensor cover remains in place.
3. Using the power cord provided, connect the incubator to a grounded power supply.
4. Switch the incubator ON using the on/off switch at the rear of the cabinet. The display will illuminate immediately.
5. Turn on the CO_2 gas supply **with the pressure regulator set to 5 psi or 0.35 bar**.

NOTE:
Be certain to check for leaks in the CO_2 connections to avoid depleting your CO_2 gas supply. This can be accomplished using a solution of soapy water applied to each fitting and checking for bubbles. If any bubbles are noted, readjust the fitting.

6. The chamber setpoints are pre-programmed at 37.0°C and 5% CO_2. Leave the incubator on until the programmed chamber temperature and CO_2 concentration has been reached (*please see* **NOTE** *below*).

NOTE:
The incubator's CO_2 valve is disabled until the incubator reaches the temperature setpoint. After reaching the temperature setpoint, the CO_2 valve is activated, allowing the incubator to reach the CO_2 setpoint. If power is interrupted to the incubator long enough for the temperature to drop below setpoint, the CO_2 valve will be deactivated until setpoint is again achieved. *(This serves to avoid spurious CO_2 readings while the incubator is reaching its temperature setpoint)*

7. Leave the incubator running for at least two hours (preferably overnight) to allow conditions to stabilize.

3.3 Using the Humidity Tray & Humidity Control

If humidification is required, the humidity tray should be filled with 0.5 liters of warm (~ 37.0ºC) distilled water at this time.

For cell culture work, we recommend the use of copper sulphate (or a recognized biocide) in the humidity tray. Tests have shown that, in addition to inhibiting bacterial growth in the tray, this can reduce contamination on the chamber walls. Add one small teaspoonful (~0.11 oz or 3.2 g) of copper sulphate each time you fill the tray with fresh water.

For IVF and other sensitive work, we do **not** recommend the use of any biocide in the humidity tray. To reduce the possibility of contamination, every 10 to 14 days, empty the tray, clean it with a solution of 70% isopropyl alcohol and 30% distilled water, and then refill it with 0.5 liters of warm distilled water.

To remove the humidity tray, turn it 45º to clear the shelf rack supports (*see Figure 3a*).

CAUTION!
Never leave water in the humidity tray while the incubator is switched off, or when a high temperature disinfection cycle is initiated, to avoid possible damage to the CO_2 sensor.

The humidity level within the chamber can be manually adjusted from ~95% to ~97%. The controller to adjust the humidity level is found on the lower, front right side of the instrument. The black adjustment knob can be rotated clockwise for standard (~95%) humidity levels, and counter-clockwise to increase the humidity level.

NOTE:
The humidity tray should always be left in place, even if the incubator is not being humidified.

3.4 Setting Temperature & CO_2

At this time, program the desired Temperature and CO_2 setpoints. Temperature and CO_2 may be set within the following ranges:

Table 4: Temperature & CO_2 Setpoint Ranges

Parameter	Available Setpoint Range
Temperature	10ºC to 50ºC (must be at least 4ºC above ambient)
CO_2	0.2% to 20%

To set the Temperature:

1. Press the Programming (⬣) key.
2. Press the Up (▲) or Down (▼) key until the desired value appears in the lefthand display.
3. Press the **enter** key to save the setpoint.
4. Now you can set the CO_2 level.

To set the CO_2 level:

1. Press the programming (⬣) key.
2. Press the up (▲) or down (▼) key until the desired value appears in the righthand display.
3. Press the **enter** key to save the setpoint.

If at any time you wish to change the CO_2 level without adjusting the Temperature setpoint, press the Programming (⬣) key twice to work in the CO_2 display.

NOTE:
CO_2 gas will NOT be injected until the incubator reaches its temperature setpoint. Allow the incubator to stabilize at the selected setpoints for at least 2 hours before continuing.

3.5 Referencing CO_2 with AutoZero

The purpose of the AutoZero system is to reference the CO_2 sensor to an atmospheric CO_2 level of 0.05%. Over a period of time, the sensor baseline may drift, causing an inaccuracy in the CO_2 level at the programmed value.

We recommend that you AutoZero the CO_2 system:

- Prior to using the incubator for the first time
- Once a month when your incubator is operating, to ensure that the CO_2 level is as accurate as possible
- After the incubator has been in storage (or transit) for a while.

To perform the AutoZero:

1. If you have not already done so, set the CO_2 level (*see Section 3.4*). There should be an audible click when the programmed level is entered: this is the CO_2 valve opening.

2. Press the ⬣ and **enter** keys simultaneously.

NOTE:
There is a magnetic switch above the door, and a magnet mounted in the door, to switch off the CO_2 valve when the door is opened.

3. The door (and inner doors, if present) must be opened and closed according to the displayed instructions, after which the process is completely automatic.

4. Open the door for 60 seconds to completely degas the chamber. A countdown is shown on the display.

5. When the display instructs you to do so, close the door. An automatic 10-minute countdown will start, to allow the chamber conditions to recover and the CO_2 sensor signal to stabilize.

6. At the end of the countdown, the sensor signal will automatically be re-referenced. The incubator will reopen the CO_2 valve to allow the CO_2 level to recover to the setpoint value.

NOTE:
Pressing any key, or opening the door during the AutoZero will automatically terminate the process and control of CO_2 will restart.

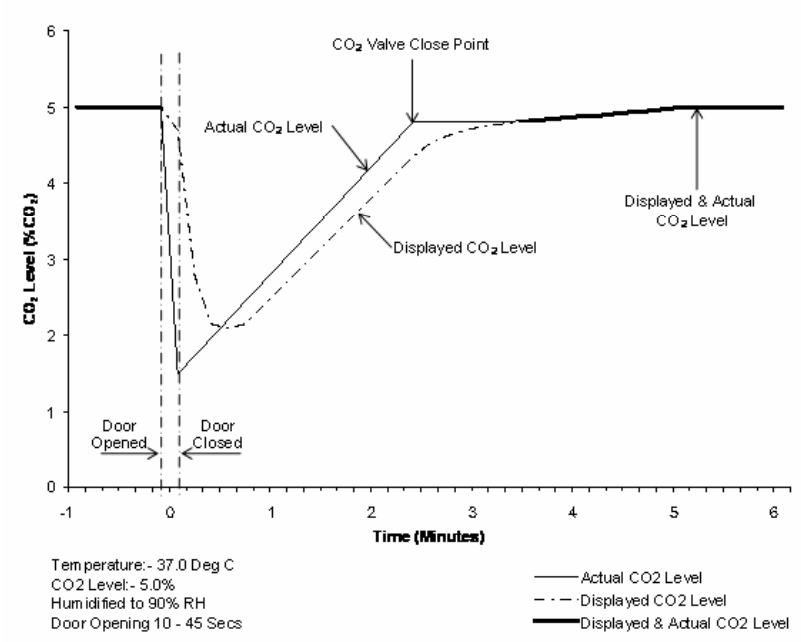
The incubator is now ready for use.

3.6 CO_2 Recovery

After a door opening, it should be possible for the *actual* CO_2 level to recover to around 4.8% in 2 to 2.5 minutes. The *displayed* CO_2 level takes 30 to 45 seconds more to catch up with the actual level. This is because it takes approximately 45 seconds from the time the gas enters the chamber to fully mix and become uniform inside the sensor.

The graph below (*Figure 6*) shows typical results for door openings between 10 and 45 seconds. The control system does this is by speeding the sensor reaction time when the door is opened and then slowing it down to produce a more accurate reading after the setpoint level is achieved.

Figure 6: Actual vs. Displayed CO_2 Levels



3.7 Programming the Alarm System

3.7.1 Setting High & Low Temperature Alarms

1. Press the **enter** & ▼ keys simultaneously to enter the alarm menu. The display will show °C. AL.
2. Press the **enter** key to display the High Temperature Alarm, HI 37.5. The factory setting is the setpoint value (37.0ºC) + 0.5°C.
3. If you wish to adjust the High Temperature Alarm, use the ▲ or ▼ key. The minimum setting, however, is 0.5°C from setpoint.
4. Press the **enter** key to save the setting, whether or not you have changed it. Now the Low Temperature Alarm is displayed, LO 36.5. The factory setting is the setpoint value (37.0ºC) - 0.5°C.
5. Use the ▲ or ▼ key if you wish to adjust the value.
6. Press the **enter** key to accept the setting, *whether or not you have changed it*.

3.7.2 Setting the CO_2 High & Low Alarms

1. While you are still in the alarm menu (*see Step 1 of Section 3.7.1 above*), press the ▲ key. The display will show CO2 AL.
2. Press the **enter** key to display HI 5.5. The factory setting is the setpoint value (5.0%) + 0.5%.
3. If you wish to adjust the High CO_2 Alarm, use the ▲ or ▼ key. The minimum setting, however, is 0.5°C from setpoint.
4. Press the **enter** key to save the setting, *whether or not you have changed it.* Now the Low CO_2 Alarm is displayed, LO 4.5. The factory setting is the setpoint value (5.0%) - 0.5%.
5. Use the ▲ or ▼ key if you wish to adjust the value.
6. Press the **enter** key to accept the setting, *whether or not you have changed it.*

3.7.3 Door Open Alarm

When you open the door, an alarm will sound after a preset time delay. If you wish to adjust the time delay:

1. In the alarm menu (*see Step 1 of Section 3.7.1 above*), press the ▲ key, the display will show door r.AL (reading across both displays).
2. Press the **enter** key and the ▲ & ▼ keys to adjust the time (as you scroll through the available choices, you will see 15, 30, 45, 60, 75 & 90 seconds, then OFF).

3. Press the **enter** key to save the desired value.

3.7.4 Alarm Duration

The following steps will adjust the length of time during which **all audible alarms** will last:

1. In the alarm menu (*see step 1 of Section 3.7.1 above*), press the ▲ key. The display shows PEr .1od (reading across both displays).
2. Press the **enter** key and the ▲ & ▼ keys to adjust the Alarm duration (as you scroll through the available choices, you will see OFF, 10 SEc, 30 SEc, 60 SEc, 600 SEc, 1 Hr, then On).
3. Press the **enter** key to select the desired value.

3.7.5 Alarm Arming Delay

This is the length of time that is allowed for the Temperature and CO_2 to recover after you open the incubator, and before the Alarm System is armed again. This helps prevent unnecessary alarms from occurring. To change the delay:

1. In alarm menu (*see step 1 of Section 3.7.1 above*), press the ▲ key. The display will show dr .dEL (across both windows).
2. Press the **enter** key and the ▲ & ▼ keys to adjust the Alarm Arming time (as you scroll through the available choices, you will see 0.15 Hr, 0.20, 0.30, 1.00, then OFF).
3. Press the **enter** key to select the desired value.

Press ⬣ to return to the main alarm programming menu, and press ⬣ again to return to the main display.

NOTE:
When alarm delay is set to OFF, the Alarms will arm only when the programmed setpoint is reached.

3.8 Chamber Alarm System

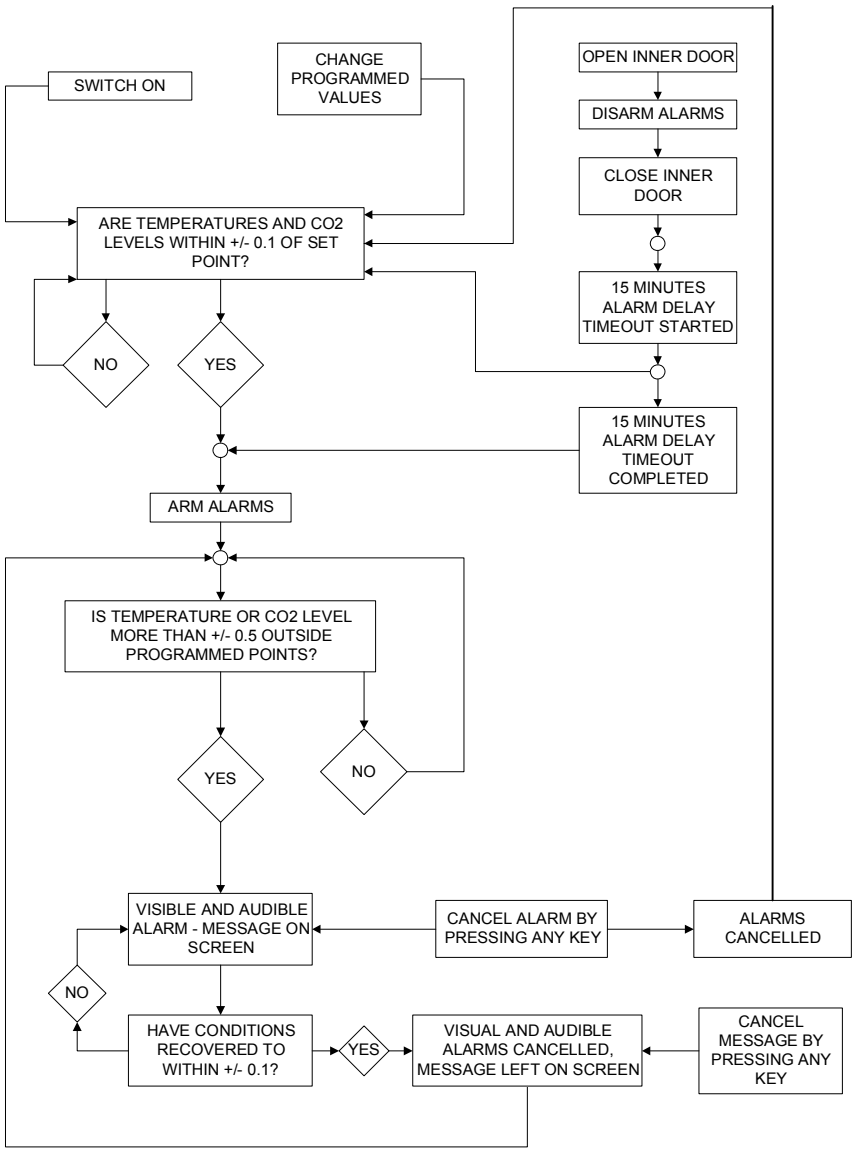
When the incubator is switched **ON**, or after any values have been reprogrammed, the Alarm System is inactive until the setpoint values (± 0.1) are achieved, after which the Alarm System is armed. *See Figure 7,* Chamber Alarm System Flow Chart*, on the following page.*

If temperature and/or CO_2 levels deviate more than the programmed amount, the display flashes, the audible alarm sounds and a message appears on the screen. You can acknowledge (and cancel) the alarm by pressing any key.

When the inner door (if fitted) is opened, the Alarm System is disabled. When you close the outer door, the preset Alarm Arming Delay starts. When the delay time expires, the Alarm System is rearmed; if the temperature and/or CO_2 should fall below or rise above the alarm setpoints, the alarm will be activated. If chamber conditions recover within the Alarm Arming Delay time, the Alarm System will be rearmed but no alarm will be activated.

If an alarm is not acknowledged but the chamber conditions subsequently recover, the audible alarm will be cancelled but the alarm message will remain on the screen to alert the user to the fact that an alarm has occurred. You can cancel this alarm message by pressing any key. The duration of the audible alarm can be adjusted from inactive to continuous (s*ee Section 3.7.4 above*).

Figure 7: Chamber Alarm System Flow Chart


SWITCH ON
CHANGE PROGRAMMED VALUES
OPEN INNER DOOR
DISARM ALARMS
CLOSE INNER DOOR
ARE TEMPERATURES AND CO2 LEVELS WITHIN +/- 0.1 OF SET POINT?
15 MINUTES ALARM DELAY TIMEOUT STARTED
NO
YES
15 MINUTES ALARM DELAY TIMEOUT COMPLETED
ARM ALARMS
IS TEMPERATURE OR CO2 LEVEL MORE THAN +/- 0.5 OUTSIDE PROGRAMMED POINTS?
YES
NO
VISIBLE AND AUDIBLE ALARM - MESSAGE ON SCREEN
CANCEL ALARM BY PRESSING ANY KEY
ALARMS CANCELLED
NO
HAVE CONDITIONS RECOVERED TO WITHIN +/- 0.1?
YES
VISUAL AND AUDIBLE ALARMS CANCELLED, MESSAGE LEFT ON SCREEN
CANCEL MESSAGE BY PRESSING ANY KEY

3.8.1 Temperature Sensor System Alarms

There are four temperature sensors: two in the door and two in the chamber. If any of these sensors should fail, the following message will appear:
°C FAIL.

Because the incubator can no longer control temperature properly without the failed sensor, the heating will switch off and the incubator will cool down to room temperature.

If, however, a sensor fails but subsequently corrects itself, the temperature control will restart and an alarm message will remain on the temperature side of the display: SAL ... (meaning Sensor Alarm).

This message can be cancelled by pressing any key.

3.8.2 Over-Temperature Cut-out & Alarm

This alarm only occurs if the chamber temperature exceeds the Temperature setpoint by 1°C or if one of the heating elements exceeds a specific activation threshold. The activation threshold is set at the factory and cannot be adjusted.

Following activation, the over-temperature cut-out & alarm system operates in two sequential modes:

Mode 1: The over-temperature cut-out & alarm activates and cuts power to the heating elements and the CO_2 control valve. The condition is shown on the display by the message CE r HP. When the chamber temperature has fallen to the programmed setpoint, the system changes to Mode 2.

Mode 2: The control system then tries to maintain the chamber temperature at the programmed level by switching the heating elements on and off, using an emergency control method that is, however, less precise. The message EAL_ will flash on-screen to signal that an over-temperature fault occurred and the incubator is being controlled by the emergency control system. *This message cannot be cancelled via the keypad.*

Normal temperature control can be regained and the over-temperature cut-out & alarm can be cancelled by reprogramming the temperature, opening and closing the door, or switching the incubator off and then back on.

If the problem persists, the alarm will recur; if this happens, please contact your service representative or your distributor immediately.

3.8.3 CO_2 Control System Alarm

This alarm only occurs if the CO_2 AutoZero cannot reference the sensor signal to atmosphere. If this is the case, at the end of the AutoZero procedure, the following message will appear: CO2 AUtO 2Er0 FAI LEd. This means that the CO_2 sensor is defective and requires replacement.

If this alarm occurs, contact your service representative immediately.

3.8.4 Review of Alarm Messages

For easy reference, Table 5 provides an overview of all alarm messages that you may encounter across both displays.

Table 5: Alarm Messages

Message	Meaning	Ref. Section
door r.AL	door open	3.7.3
CF AIL	temperature sensor failure	3.8.1
SAL	sensor alarm after sensor recovers	3.8.1
CL r iP	over-temperature cut-out has cut power to heating elements and CO_2 valve	3.8.2
tAL	over-temperature defect has occurred and system is under emergency control	3.8.2
CO2 AUtO 2Er0 FAILEd	CO_2 sensor is defective and needs to be replaced	3.8.3

4 ROUTINE MAINTENANCE

4.1 General Notes

To ensure that chamber conditions remain as stable as possible, minimize the length of time that the door is open. The magnetic door catches are specifically designed to make door opening and closing as easy as possible. When you open the door, wipe off any small drops of condensate that may have formed on the inner seal. This will avoid a build-up of condensation.

If you are using the humidity tray for humidification, be sure to follow the indications provided *in Section 3.3*.

4.2 Daily Checks

1. Check that the temperature and CO_2 levels are reading within specification.

2. Check the reserve pressure in the CO_2 cylinder (normally 725 psi or 50 bar when full). The design of the incubator ensures very low consumption of CO_2: during normal working conditions, a typical large cylinder should last approximately 12 months (frequent door openings will deplete the supply more rapidly, however). If there is a significant drop at the cylinder pressure of 725 psi or 50 bar, it means that the cylinder is almost empty and should be replaced. Making certain that there are no leaks at any of the connections will ensure a greater lifetime to the CO_2 supply and will help avoid accidentally running out of CO_2.

3. Any spills in the chamber should be cleaned immediately to protect the stainless steel surfaces.

4.3 Monthly Check

Remember that we recommend routine replacement of the water in the humidity tray, and that you clean the tray at the same time.

1. If you are not changing the humidity tray water and cleaning the humidity tray regularly, you should at least fill the humidity tray once a month. Do not, however, exceed the maximum volume of 0.5 liters. Use warm water (~37.0°C) to ensure a rapid return to optimum chamber conditions. After adding water, check that the humidity tray is centered between the shelf rack supports.

2. If required, you can take a sample of the gas inside the chamber using the CO_2 sample port, and check it using a CO_2 gas analyzer. The CO_2 sample port is located at the top of the rear panel.

   If you conduct a sampling, please do the following:

   - Turn off the CO_2 gas by re-programming the setpoint for CO_2 to 0.0% to prevent CO_2 from being injected into the chamber and giving a false reading.
   - Use a flow rate that is ≤ 0.5 liters/minute to take a sample.
   - Keep the door closed to minimize heat loss.
   - Remember to reset the CO_2 setpoint to the desired level after sampling.

   We recommend that you perform a CO_2 AutoZero prior to sampling (*see Section 3.5*).

3. We also recommend that you AutoZero the CO_2 system at least once every 28 days to ensure that CO_2 level is correct.

5 CLEANING & DISINFECTING

5.1 Cleaning

1. Routinely clean the exterior of the incubator by wiping it over with a soft cloth, moistened with soapy water.

2. Rinse the soap from the cloth in clean water, and wipe the exterior surfaces again.

CAUTION!

Be sure to use only approved cleaning fluids and materials. Solvents, chloride-based cleaning substances and abrasive materials, among others, may cause permanent damage to the product surfaces. Also be sure to wipe all surfaces dry, leaving them free from any foreign particulates or fluids which could cause subsequent surface damage. (See the CAUTIONs in Section 5.2).

5.2 Disinfecting

The recommended disinfecting agent for use with the incubator is a solution of 70% isopropanol (isopropyl alcohol) and 30% distilled water. Be sure to follow appropriate safety regulations while you are using this solution:

WARNING!

- **As a routine precaution, wear protective gloves.**
- **Be sure to adequately ventilate the work area as you are disinfecting, to avoid the formation of potentially explosive alcohol vapors.**
- **Protect all electrical connections from contact with the alcohol solution.**

To best protect yourself, your incubator and your work area, follow these instructions:

1. Program 0.0% CO_2 and switch off the incubator. Unplug the incubator from the power supply.

2. Dampen a clean cloth with the alcohol solution and wipe down all external surfaces, taking care to keep the alcohol solution from coming into contact with any electrical outlets or assemblies.

3. Remove all of the shelves, the humidity tray and the shelf racks.

4. Place the black protective cover over the CO_2 sensor. Also protect any additional sensors, such as Oxygen or Humidity, with the cover(s) supplied.

CAUTION!

It is very important to ensure that no liquid is spilled onto the white porous CO_2 sensor cover at the rear of the chamber. Failure to use the protective cover(s) could result in damage to the sensor(s) and may affect your warranty.

5. You can clean the humidity tray by rinsing it in sterile water, wiping it down with the alcohol solution, and then rinsing it with sterile water.

6. Wipe down the inside of the chamber with the alcohol solution, and leave it to dry completely.

CAUTION!

Never use any of the following substances to clean the stainless steel, or damage will result: Sodium Azide, Aqua Regia, Iodine, Ferric Chloride or Sulphuric Acid.

7. Wipe the internal components of the chamber twice with the alcohol solution. Wipe off excess liquid and leave it to dry completely.

8. Reassemble the shelf racks and the shelves before switching the incubator on. Wipe the inside door seal with the alcohol solution, rinse and leave to dry.

9. Taking care to leave the white porous cover(s) in place, be sure to remove the black protective cover(s) from the sensor(s) and place them in the holder at the rear of the incubator for safekeeping (protective covers must also be removed from any additional sensors installed, such as Oxygen or Humidity).

10. Refill the humidity tray (*as explained in Section 3.3*). When you reinstall it, ensure that the humidity tray is centered between the shelf rack supports.

11. Leave the incubator on for at least two hours (preferably overnight) to allow conditions to stabilize.

12. When the incubator has stabilized, carry out an AutoZero and reprogram the desired CO_2 level. It may be necessary to open the glass door briefly if, after performing an AutoZero, the CO_2 level is too high.

6 SPECIFICATIONS

Table 6: Specifications

Galaxy 48 S Incubator Specifications	
Temperature Management	▪ Digital programming via microprocessor control on 0.1°C increments. Measurement of chamber and door temperature via 4 RT* matched thermistors (sensitivity 0.01°C) ▪ Adjustable independent control of door heater ▪ "Out of Limits" temperature protection system independent of microprocessor control.
Range	4°C above ambient temperature to 50°C
Control	± 0.1°C
Stability	± 0.1°C
Uniformity	± 0.3°C
CO_2 Control	Solid-state infrared CO_2 sensor operating independent of humidity. Programmable, semi-automatic zeroing function.
Range:	0.2 - 20%
Control:	± 0.1%
Stability:	± 0.2%
Uniformity:	± 0.1%
Recovery Rate:	Better than 1.5% minute
Gas Connections:	~1/4-inch or 6mm tubing
Required Gas Pressure:	5 psi / 0.35 bar
Relative Humidity	Removable stainless steel humidity tray
Reservoir Capacity:	0.5 liters
Humidity Control: *manual*	Normal: 90-95% at 37°C High: 97% at 37°C
Shelves	Polished stainless steel, non-perforated (standard).
Usable Area:	875cm^2 per shelf
Number of Shelves:	3 standard ; with Multiple Position Option, up to 6 shelves
Alarm Systems	Two-level alarm system giving programmable audio/visual warnings with options for remote communication. Level 1 signals system failures, level 2 is programmable and monitors chamber conditions.
Dimensions	Seamless interior with removable door seal
Chamber (HxWxD):	401 x 401 x 308mm or 15.8 x 15.8 x 12.1 inches
Chamber Volume:	48 liters or 1.7 cu ft
External (HxWxD):	648 x 484 x 475mm or 25.5 x 19.1 x 18.7 inches
External, Crated (HxWxD):	920 x 630 x 630mm or 36.2 x 24.8 x 24.8 inches (Including pallet)
Weight	Crated: 50 kg/110.2 lbs Uncrated: 32kg/70.5 lbs (with standard features)

*RT = Resistance Temperature curve

...continued...

Galaxy 48 S Incubator Specifications	
Grounded Electrical Supply	
Voltage:	100-120V 50/60Hz or 220-240V 50/60Hz
Power:	▪ 500 watts, Standard models ▪ 700 watts, High Temperature Disinfection models
Energy to maintain 37°C:	< 0.1kWh
Storage Temperature	10 - 50°C

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7 OPTIONS & ACCESSORIES

7.1 Options

Some option combinations are not possible; others may incur extra cost. Please inquire before ordering.

Table 7: Available Options

Option	NBS Part Number	Retrofittable in Field?
Split Inner Door	P0628-5330	No
Alarm Relay Contacts	P0628-5340	Yes
Internal Power Receptacle	P0628-5350	No

7.2 Available Accessories

Table 8: Available Accessories

Accessory	NBS Part Number
CO_2 Bottle Automatic Change-Over Instrument	P0628-5000
CO_2 Two Stage Regulator	P0628-5010
CO_2 Supply Line Filters, HEPA	P0628-5020
In-Line Pressure Regulator	P0628-5030
CO_2 Gas Analyzer Kit	P0628-5040
10 Spare CO_2 Gas Analyzer Tubes	P0628-5050
Air Zero Filters, HEPA (supplied in pairs)	P0628-5060
Non - Perforated Shelves	P0628-5070
Perforated Shelves	P0628-5080
Floor Stand & Stacking Frame, for double stacking	P0628-5090
Multi-position Shelf Racks (Max 6 positions)	P0628-5100

8 DRAWINGS & TABLES

8.1 List of Drawings

Following is a key to the illustrations in this manual:

Figure	Description	Page
1	Installing Shelf Racks	14
2	Installing Shelves	15
3	Installing/Removing the Humidity Tray	15
4	AutoZero HEPA Filter & Fitting	16
5	Control Panel	17
6	Actual vs. Displayed CO_2 Levels	21
7	Chamber Alarm System Flow Chart	25

8.2 List of Tables

Following is a key to the tables in this manual:

Table	Description	Page
1	Accessories Provided	12
2	Utilities	12
3	Function Keys	17
4	Temperature and CO_2 Setpoint Ranges	19
5	Alarm Messages	27
6	Specifications	33
7	Available Options	35
8	Available Accessories	35

9 CE CERTIFICATION

New Brunswick
an eppendorf company

CE Conformity Certification

Galaxy 48 S
Declaration of Conformity

Declare that the Galaxy 48 S CO_2 Incubator Model Numbers CO48S-120-0000 and CO48S-230-0000 to which this declaration relates are in conformity to the following standards:

EN 61010 - 1 1993 Safety requirement for electrical equipment for measurement, control and laboratory use.
(Classification Class 1, Installation Category 11, Pollution Degree 2)

EN 50081 - 1 1992, EN 50082 - 1 1992, Electromagnetic Compatibility
(Generic Emission / Immunity Standard)

Following the provision of:

Directive 73 / 23 / EC Low Voltage
Directive 89 / 336 / Electromagnetic Compatibility

Mike King
Managing Director,
New Brunswick UK Operations

9th April 2009

QF51

RS Biotech Laboratory Equipment Ltd., 1 Drummond Crescent, Irvine, Ayrshire, KA11 5AN, SCOTLAND, UK

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